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THE BRIGHTEST HIGH-LATITUDE 12-MICRON *IRAS** SOURCES

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The *Infrared Astronomical Satellite (IRAS)* Point Source catalog was searched for sources brighter than 28 Jy (0 mag) at 12 μm with absolute galactic latitude greater than 30° excluding the Large Magellanic Cloud. The search resulted in 269 sources, two of which are the galaxies NGC 1068 and M82. The remaining 267 sources are identified with, or have infrared color indices consistent with late-type stars some of which show evidence of circumstellar dust shells. Seven sources are previously uncataloged stars. K and M stars without circumstellar dust shells, M stars with circumstellar dust shells, and carbon stars occupy well-defined regions of infrared color-color diagrams.

Key words: infrared sources—late-type stars—circumstellar matter

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I. Introduction

The *Infrared Astronomical Satellite* (*IRAS*) performed a survey that covered 96% of the sky and is complete to 0.5 Jy at wavelengths of 12 μm, 25 μm, and 60 μm and to 1.5 Jy at 100 μm. The survey sensitivity at 12 μm corresponds to about [12 μm] = 4.4 mag. Previous surveys of the infrared sky include *The Revised AFGL Infrared Sky Survey Catalog* (Price and Murdock 1983; henceforth RAFGL) which covered 92.5% of the sky at 11 μm and was complete to about [11 μm] = 1.0 mag and the Caltech *Two Micron Sky Survey Catalog* (Neugebauer and Leighton 1969; henceforth IRC) which was complete for declinations north of $-33°$ to [2.2 μm] < 3.0 mag.

In this paper, the brightest high-galactic-latitude 12 μm point sources with [12 μm] < 0 mag found by *IRAS* have been selected with the intention of assembling the data for sources which can be studied easily from the ground. No detailed discussion of the physical properties of these sources is given. No new population of astrophysical objects is found among this sample of *IRAS* sources.

II. Observations

The *IRAS* Point Source Catalog (1984) was searched for 12 μm sources with an average 12 μm flux density greater than 28 Jy (0 mag) and an absolute galactic latitude greater than 30°. The Large Magellanic Cloud was omitted due to the high density of sources there. These selection criteria improve the reliability of the 60 μm and 100 μm measurements that tend to be most affected by the "cirrus" (Low et al. 1984) and the high source density found at lower latitudes.

The search of the catalog resulted in 269 sources. In addition, two sources not found in the Point Source Catalog (22042+1138 and 22596+1019) are included that lie within a narrow region (about 2% of the sky) observed by one or more scans of the satellite but not enough times to be properly confirmed (*IRAS Explanatory Supplement* 1984; henceforth the *Supplement*). The *IRAS* data for these sources are given in Table I. The source name is given in the same format as used in the *IRAS* Point Source Catalog. The flux densities were color-corrected by fitting flux ratios of neighboring wavelength bands to a Planck function. [If a wavelength band was observed fluxes in two neighboring bands, then an average flux density was used from the two fits.] When a 100 μm upper limit is quoted the 60 μm flux density was color corrected using only the 25 μm–60 μm fit. All flux densities discussed in this paper, including the 28 Jy threshold at 12 μm, refer to the color-corrected values.

Sources with flux densities brighter than 28 Jy at 12 μm are approximately 50 times brighter than the completeness limit estimated in the *Supplement*. Thus, the present sample ought to be 100% complete in the surveyed area, as well as 100% reliable (no false sources). Excluding incompleteness due to variability we conclude that the completeness of the sample is simply the completeness of the sky coverage, i.e., 93% of the sky with galactic latitude greater than 30°.

The relative photometric precision for detected sources is wavelength dependent and ranges from 5% to 10% (1 σ) for the 12, 25, 60, and the bright ($>$ 3 Jy) 100 μm detections. Flux densities greater than 100 Jy at 100 μm may have larger uncertainties due to detector nonlinearities. The fainter 100 μm detections have relative photometric uncertainties that range from 10% to 50%. The absolute calibration is accurate to 5% at 12, 25, and 60 μm and 10% at 100 μm (*Supplement*).

The positional uncertainty of the sample was determined from the 176 sources that have optical counterparts listed in the *Smithsonian Astrophysical Observatory Star Catalog* (SAO 1966; henceforth SAO). No statistically significant mean positional discrepancy was found. The rms dispersion about the mean was found to be 1″.9 along the *IRAS* scan direction (Gaussian distribution) and 6″.9 perpendicular to the *IRAS* scan direction (non-Gaussian distribution, Fowler and Rolfe (1982)). Since there are no systematic differences between the sources found in the SAO and those that are not, these positional uncertainties should apply to the sample as a whole. These positional uncertainties are typical of those quoted in the Point Source Catalog for sources detected at 12 μm and 25 μm.

For 30 of the stars, the Point Source Catalog indicated the existence of nearby small extended sources at various wavelengths. Because of the rudimentary nature of the processing of the small extended sources, it is necessary to examine the reality of the extended structure more carefully. In fact, as discussed below, only 12 of the 30 sources showed true extended emission at 60 μm or 100 μm. No source showed extended emission at 12 μm or 25 μm.

Fifteen of the 30 small extended sources were caused by optical cross-talk from the bright point source. The total flux density was a few percent to one-third of the flux density in the bright point sources. The point-source flux densities for these 15 stars were adopted.

For the remaining 15 stars, the detector output for all survey scans was retrieved and the scans over each source measured independently for extent and total emission. One source was found to be pointlike with some evidence for a faint asymmetric extension. Two sources had nearby point-source companions; the combination was detected as an extended source on some scans. For those three sources, the point-source flux densities listed in the catalog were kept.

For eight of the remaining 12 sources, total flux densities at 60 μm and 100 μm were estimated by integrating the output from each detector that scanned over the source. For the last four, the source extent at 60 μm and 100 μm in the scan direction was larger than a detector length (about 5′) so the total flux estimate involved adding the signals from pairs of adjacent detectors. Thus a total of 12 sources have had their point-source flux densities corrected to take into account extended emission and are

TABLE I

Cataloged Parameters

Name	RA (1950)	DEC	12μm	25μm	60μm	100μm	IRAS Spectral Class
			Flux Densities (Jy)				
00050-2546	00 05 03.6	-25 46 22	34.9	15.3	2.2	1.0	26
00121-1912	00 12 06.0	-19 12 40	29.6	6.9	1.3	<1.0	19
00128-3219	00 12 50.6	-32 19 26	83.1	28.0	5.2	1.9	15
00192-2020	00 19 14.6	-20 20 06	145	42.2	11.2	4.2	16
00193-4033	00 19 19.3	-40 33 51	271	112	13.0	3.0	28
00238-4234	00 23 49.7	-42 34 49	38.9	9.8	1.4	<1.1	18
00245-0652	00 24 33.8	-06 52 53	102	44.8	9.1	4.0	14
00254+1736	00 25 26.2	+17 36 57	44.5	12.8	1.8	<1.3 (1)	--
00254-3317	00 25 26.8	-33 17 04	32.7	8.7	1.5	1.1 (1)	18
00254-1156	00 25 28.6	-11 56 04	46.0	12.2	2.8	1.7	17
00410-1815	00 41 05.7	-18 15 36	41.4	9.7	1.5	<3.1	18
00439+1512	00 43 55.2	+15 12 06	29.8	7.5	1.2	<0.9 (1)	--
00445+3224	00 44 35.9	+32 24 37	31.8	14.1	3.1	1.9	22
00515-6308	00 51 34.3	-63 08 28	30.0	7.9	1.5	1.0	--
01030-3157	01 03 05.5	-31 57 46	35.6	12.1	2.0	1.4	15
01037+1219	01 03 48.0	+12 19 51	1160	770	169	65.6	--
01085+3022	01 08 30.3	+30 22 09	161	92.3	14.3	5.6	29
01217+2341	01 21 46.4	+23 41 03	34.9	15.2	2.2	<0.9 (1)	23
01246-3248	01 24 40.3	-32 48 08	142	71.4	46.8	21.0	--
01251+1626	01 25 09.3	+16 26 44	30.2	13.8	2.0	<1.6	28
01261-4334	01 26 11.5	-43 34 34	48.8	11.9	1.9	<1.0	16
01438+1850	01 43 52.0	+18 50 09	67.8	29.6	5.2	2.5 (1)	23
01452-8026	01 45 17.6	-80 26 05	34.0	15.7	5.2	8.1 (3)	15
01516-4632	01 51 38.7	-46 32 50	63.8	16.8	2.9	1.2	18
01527+1656	01 52 47.3	+16 56 39	31.6	15.1	2.1	1.0	25
01576-2119	01 57 38.5	-21 19 13	31.3	8.0	1.3	<0.9	17
01579-0845	01 57 58.3	-08 45 53	51.0	13.5	2.3	0.9	18
02000+0726	02 00 00.2	+07 26 12	83.5	34.8	9.1	4.6 (1)	22
02036-1027	02 03 38.4	-10 27 00	37.9	16.0	2.5	1.0	--
02043+2313	02 04 22.7	+23 13 39	55.7	14.6	2.5	1.0	18
02152+2822	02 15 12.5	+28 22 59	124	92.0	22.8	6.1	43
02168-0312	02 16 49.1	-03 12 22	4180	1670	228	79.9	--
02234-0024	02 23 29.0	-00 24 10	28.3	16.3	3.0	1.5 (2)	29
02270-6944	02 27 01.3	-69 44 45	46.3	12.4	2.3	1.3 (2)	17
02270-2619	02 27 02.0	-26 19 14	190	56.0	12.1	4.4	43
02351-2711	02 35 11.4	-27 11 37	388	192	25.8	8.4	29
02401-0013	02 40 07.2	-00 13 30	45.0	89.6	189	239	32
02427-5430	02 42 42.0	-54 30 44	163	74.5	8.5	3.8	22
02455-1240	02 45 32.3	-12 40 05	52.9	19.9	3.1	1.2	25
02455+1718	02 45 32.8	+17 18 11	79.1	27.9	5.0	2.7 (1)	16
02464-5915	02 46 25.4	-59 15 33	48.3	17.2	3.3	1.6	16
02497-0828	02 49 47.0	-08 28 17	37.8	15.1	2.4	0.8	21
02522-5005	02 52 12.7	-50 05 32	611	230	42.6	19.8 (2)	24
02529+1807	02 52 59.2	+18 07 48	105	26.8	4.7	1.9 (1)	18
02547+1106	02 54 44.3	+11 06 03	32.3	22.8	4.6	<1.6 (1)	28
02587+2136	02 58 42.3	+21 36 23	28.2	11.1	1.8	<1.3 (1)	14

TABLE I (Continued)

Name	RA (1950)	DEC	12μm	25μm	60μm	100μm	IRAS Spectral Class
02596+0353	02 59 39.8	+03 53 38	164	39.6	6.6	2.1 (1)	18
03082+1436	03 08 16.2	+14 36 40	56.8	19.4	3.8	1.5 (1)	21
03112-5730	03 11 16.8	-57 30 26	83.1	29.7	5.6	2.3	43
03172-2156	03 17 17.3	-21 56 21	113	26.9	4.3	1.4	17
03287-1535	03 28 44.8	-15 35 02	54.4	41.4	9.8	3.4 (1)	29
03318-1619	03 31 53.6	-16 19 48	129	45.3	7.5	3.2 (1)	15
03336-7636	03 33 40.0	-76 36 57	41.9	17.1	2.7	1.0 (1,2)	26
03364-5533	03 36 29.4	-55 33 30	57.6	21.3	3.0	1.3 (1)	16
03463-0710	03 46 20.6	-07 10 01	28.5	10.0	3.9	7.9 (1,3)	17
03479-7423	03 47 59.7	-74 23 29	79.1	20.2	3.1	1.2 (1)	18
03482-5213	03 48 13.9	-52 13 49	51.1	20.7	2.8	1.2	22
03489-0131	03 48 54.8	-01 31 14	69.2	28.0	4.6	2.5 (1)	24
03505-0919	03 50 30.6	-09 19 01	33.7	12.5	2.0	<1.0 (1)	26
03507+1115	03 50 43.5	+11 15 29	4080	1770	252	93.0 (1)	26
03511-4558	03 51 11.8	-45 58 38	49.0	19.5	2.8	1.3	25
03557-1339	03 55 42.1	-13 39 00	77.4	19.3	3.5	1.0	18
04001-6217	04 00 10.0	-62 17 51	59.3	15.7	2.4	0.8	18
04020-1551	04 02 01.6	-15 51 38	295	137	19.7	8.9 (3)	22
04094-2515	04 09 25.2	-25 15 44	82.0	31.1	4.6	2.0 (1)	24
04140-8158	04 14 00.8	-81 58 53	292	118	18.6	7.4 (2)	24
04157-1837	04 15 42.5	-18 37 42	35.2	12.8	2.1	1.2	--
04311-0004	04 31 11.3	-00 04 36	33.3	12.6	2.0	1.0 (1,2)	14
04330-6307	04 33 01.7	-63 07 45	29.3	9.8	1.6	1.2 (1)	15
04345-2740	04 34 33.4	-27 40 44	29.6	11.7	2.1	1.2	15
04361-6210	04 36 10.4	-62 10 27	4240	1268	189	73.6	--
04382-1417	04 38 14.8	-14 17 47	92.1	39.7	6.8	3.6 (1)	21
04382-1946	04 38 15.1	-19 46 02	48.0	12.2	2.2	1.0	18
04387-3819	04 38 46.0	-38 19 49	132	49.5	7.2	2.9	23
04404-7427	04 40 26.9	-74 27 27	63.4	37.2	5.2	1.9 (2)	29
04573-1452	04 57 19.4	-14 52 49	287	87.4	20.4	8.2 (1,2)	45
05027-2158	05 02 42.8	-21 58 20	139	61.0	9.3	4.8 (2)	15
05033-2226	05 03 21.0	-22 26 18	41.5	11.3	1.6	<1.0 (1)	18
05069-3434	05 06 58.3	-34 34 47	80.5	28.3	6.4	3.4	16
05071-6327	05 07 10.1	-63 27 44	29.5	7.4	1.2	<0.9	18
05096-4834	05 09 37.6	-48 34 01	168	66.7	11.5	5.1 (2)	25
05098-6422	05 09 50.5	-64 22 41	120	62.2	12.8	5.9 (2)	26
05217-3943	05 21 44.8	-39 43 23	29.6	14.7	2.3	<1.3	26
05418-4628	05 41 50.7	-46 28 30	42.2	13.1	4.5	3.5	41
08063+6522	08 06 18.5	+65 22 21	40.1	16.6	3.2	1.7	16
08525+1725	08 52 34.2	+17 25 22	66.2	19.5	5.8	3.0	42
08538+2002	08 53 48.8	+20 02 30	44.4	12.3	3.0	1.3	23
08555+1102	08 55 33.1	+11 02 22	60.1	21.3	3.2	1.2	41
09057+1325	09 05 42.1	+13 25 23	78.6	33.7	6.5	3.7	15
09069+2527	09 06 57.9	+25 27 06	56.5	24.4	4.4	1.9	23
09076+3110	09 07 37.7	+31 10 04	404	154	24.5	8.9	22
09180+3436	09 18 00.7	+34 36 17	60.0	13.9	2.3	0.9	18
09180+5654	09 18 04.4	+56 54 43	29.1	7.8	1.3	<1.0	18

TABLE I (Continued)

Name	RA (1950)	DEC (1950)	Flux Densities (Jy) 12μm	25μm	60μm	100μm	IRAS Spectral Class
09425+3444	09 42 34.4	+34 44 35	354	129	19.5	7.0 (2)	24
09429+5721	09 43 00.0	+57 21 33	28.8	7.4	1.3	<1.0	17
09448+1139	09 44 52.1	+11 39 41	1625	475	88.7	35.6 (2)	--
09452+1330	09 45 14.2	+13 30 40	41207	18000	4375	846	43
09517+6954	09 51 42.4	+69 54 59	64.1	300	1200	1130 (1)	81
10131+3049	10 13 10.7	+30 49 17	2660	927	212	77.9	04
10172+2005	10 17 13.6	+20 05 38	59.2	14.2	2.7	1.0	18
10193+4145	10 19 19.5	+41 45 13	71.5	18.1	3.0	1.3	--
10305+7001	10 30 35.0	+70 01 23	28.0	11.1	1.9	1.0	22
10350-1307	10 35 03.2	-13 07 16	163	55.2	45.0	40.2 (3)	--
10353-1145	10 35 20.5	-11 45 22	61.1	29.1	4.7	1.9--	
10411+6902	10 41 07.3	+69 02 18	85.7	40.9	5.5	2.5 (2)	23
10416+6740	10 41 38.1	+67 40 21	37.5	11.0	6.8	5.8 (3)	42
10491-2059	10 49 11.4	-20 59 06	921	349	75.8	26.7	--
10521+7208	10 52 07.6	+72 08 12	32.3	15.6	3.4	1.5 (1,2)	26
10580-1803	10 58 05.6	-18 03 20	552	227	39.1	17.9	22
11006+6201	11 00 38.9	+62 01 14	59.5	14.3	2.4	1.0	18
11125+7524	11 12 32.1	+75 24 54	82.0	37.2	5.7	3.1	23
11251+4527	11 25 06.6	+45 27 39	36.9	13.9	2.5	1.1	--
11252+1525	11 25 16.4	+15 25 22	44.8	23.0	2.9	1.2	--
11284+6936	11 28 27.8	+69 36 21	38.7	10.0	1.7	<1.0	18
11308-1020	11 30 52.4	-10 20 26	46.7	16.7	3.7	1.2	44
11358+0824	11 35 53.3	+08 24 39	44.2	11.3	2.1	<1.2 (1)	18
11432+0648	11 43 16.6	+06 48 35	30.5	7.8	1.3	<1.0	--
11445+4344	11 44 36.0	+43 44 57	72.4	40.2	5.2	2.2	--
11462-2628	11 46 13.0	-26 28 17	47.4	12.2	2.3	0.9	18
11473-2718	11 47 19.4	-27 18 17	32.3	12.5	1.9	<1.3	22
11485-1055	11 48 32.8	-10 55 47	66.4	23.0	4.8	4.2	--
11501-0719	11 50 11.7	-07 19 08	44.7	16.8	3.3	1.7	16
11538+5808	11 53 54.0	+58 08 59	53.3	19.1	3.3	1.5	16
12020+0254	12 02 01.6	+ 2 54 00	28.1	13.7	2.3	<1.2	26
12046-0629	12 04 41.2	-06 29 16	72.1	26.5	3.6	1.6 (1)	--
12075-2220	12 07 32.1	-22 20 25	28.9	7.3	1.4	<1.2 (1)	17
12226+0102	12 22 40.5	+01 02 47	69.8	21.2	4.3	1.6	04
12277+0441	12 27 47.8	+04 41 34	207	76.0	15.0	6.9	15
12344+2720	12 34 24.4	+27 20 30	66.4	28.4	4.1	2.1	--
12345-1715	12 34 30.0	-17 15 04	28.9	11.4	3.4	3.1	--
12380+5607	12 38 03.5	+56 07 19	166	67.9	12.9	6.8	15
12427+4542	12 42 47.2	+45 42 45	197	52.8	23.3	9.6 (3)	42
12447+0425	12 44 45.8	+04 25 03	173	51.1	10.3	3.4	44
12517-0915	12 51 44.3	-09 15 59	32.5	7.5	1.4	<2.1	18
12526+4728	12 52 39.7	+47 28 02	41.2	10.9	1.8	<1.0	--
12530+0340	12 53 04.4	+03 40 03	115	28.8	4.4	1.5	18
12544+6615	12 54 27.1	+66 15 57	80.0	23.7	6.7	3.9	41
12562+2324	12 56 12.1	+23 24 34	30.9	15.0	2.8	1.1	28

TABLE I (Continued)

Name	RA (1950)	DEC (1950)	Flux Densities (Jy) 12μm	25μm	60μm	100μm	IRAS Spectral Class
13001+0527	13 00 06.1	+05 27 14	401	168	30.7	13.4	21
13039+2253	13 03 56.4	+22 53 03	46.0	12.1	2.3	1.2	18
13114-0232	13 11 29.7	-02 32 34	595	252	37.2	13.5	--
13172+4547	13 17 17.1	+45 47 20	114	47.4	4.1	1.3 (1)	29
13269-2301	13 26 58.4	-23 01 27	1280	427	85.6	30.9 (3)	15
13303-0656	13 30 22.8	-06 56 18	112	40.2	6.1	2.0	16
13462-2807	13 46 12.5	-28 07 11	3086	855	153	66.0	02
13468+3947	13 46 48.1	+39 47 28	84.4	29.7	4.6	1.7	15
13492-0325	13 49 15.5	-03 25 43	40.1	16.3	2.9	1.0	16
13495+3441	13 49 34.8	+34 41 30	33.9	8.1	1.3	<1.1	80
13499+6458	13 49 57.2	+64 58 15	39.9	10.6	1.9	0.9	18
13582+3806	13 58 14.6	+38 06 43	39.9	20.6	3.6	1.4	--
14059+4405	14 05 55.5	+44 05 30	50.0	13.4	2.2	<1.1	18
14086-0730	14 08 38.9	-07 30 44	136	77.7	12.8	4.3	--
14086-2839	14 08 40.9	-28 39 03	67.8	29.1	5.3	2.1	26
14133+1925	14 13 19.6	+19 25 27	547	116	19.3	7.0	18
14142-1612	14 14 14.6	-16 12 29	56.9	25.5	4.4	1.8	22
14162+6701	14 16 13.4	+67 01 28	51.2	18.4	2.7	1.2 (1)	15
14219+2555	14 21 56.4	+25 55 48	737	310	53.9	23.3	--
14247+0454	14 24 45.2	+04 54 07	100	49.5	9.2	3.8	24
14277+3904	14 27 43.8	+39 05 00	32.9	10.5	1.6	<1.0	16
14371+3245	14 37 09.0	+32 45 15	113	52.4	8.2	3.1	22
14390+3147	14 39 05.9	+31 47 07	53.1	22.5	4.5	2.6	23
14412+2644	14 41 13.9	+26 44 19	28.1	7.3	1.2	<1.0	18
14427+2717	14 42 47.9	+27 17 04	32.0	7.6	1.1	<1.0	--
14437+1520	14 43 44.3	+15 20 26	77.4	21.1	4.0	1.6 (1)	17
14508+7421	14 50 48.9	+74 21 45	112	27.0	4.4	1.8	18
14550-1214	14 55 00.9	-12 14 08	78.3	31.4	5.5	2.7	22
14567+6607	14 56 46.0	+66 07 57	89.5	23.7	3.9	1.1	18
15060+0947	15 06 00.2	+09 47 43	34.7	20.4	3.0	1.2	28
15193+1429	15 19 19.4	+14 29 33	35.9	14.5	5.0	4.2	22
15193+3132	15 19 20.5	+31 32 47	187	94.3	14.9	6.4	24
15223-0203	15 22 19.0	-02 03 34	95.0	49.9	8.6	3.1	24
15255+1944	15 25 32.2	+19 44 10	220	113	13.8	4.7 (1)	29
15262+0400	15 26 13.6	+04 00 02	43.9	23.3	3.5	1.3	27
15298+0348	15 29 53.8	+03 48 36	37.3	14.1	1.8	<1.1 (1)	14
15314+7847	15 31 24.1	+78 47 54	120	43.2	5.7	2.3 (2)	21
15341+1515	15 34 08.8	+15 15 55	163	68.2	12.5	5.0	22
15361+2441	15 36 07.5	+24 41 05	64.6	17.8	4.6	2.7 (3)	17
15410-0133	15 41 00.4	-01 33 09	98.1	34.7	5.6	2.2	21
15418+0634	15 41 49.2	+06 34 53	28.7	7.1	1.2	<1.0 (1)	18
15464+1817	15 46 29.1	+18 17 37	31.8	8.4	1.7	1.2 (1)	18
15465+2818	15 46 31.7	+28 18 29	32.9	13.2	6.1	8.3 (3)	15
15477+3943	15 47 44.9	+39 43 15	79.2	23.8	4.8	1.8	--
15483+1517	15 48 23.0	+15 17 02	154	51.9	8.5	3.2	24
15492+4837	15 49 16.0	+48 37 55	173	72.2	12.8	5.3	41
15566+3609	15 56 38.9	+36 09 48	46.8	20.7	2.6	1.2	26

TABLE I (Continued)

Name	RA (1950)	DEC (1950)	Flux Densities (Jy) 12μm	25μm	60μm	100μm	IRAS Spectral Class
16011+4722	16 01 07.9	+47 22 36	423	179.0	31.7	16.7	24
16081+2511	16 08 08.6	+25 11 59	147	57.7	8.9	4.0	23
16095+2337	16 09 30.0	+23 37 22	32.1	8.3	1.4	<1.0 (1)	17
16117-0334	16 11 43.1	-03 34 06	106	26.7	4.4	1.6 (1)	18
16164+5952	16 16 24.7	+59 52 32	34.9	9.4	1.8	1.1	18
16235+1900	16 23 34.8	+19 00 15	398	131	20.9	8.7 (2)	23
16260+3454	16 26 00.6	+34 54 45	61.9	38.9	8.0	3.3 (2)	28
16269+4159	16 27 00.0	+41 59 23	343	108	17.7	5.8	16
16306+7223	16 30 37.2	+72 23 14	88.6	33.2	5.7	3.1	15
16418+5459	16 41 51.7	+54 59 45	118	54.5	9.4	4.0	24
16432+1213	16 43 13.9	+12 13 37	28.8	9.7	1.5	<1.0 (1,2)	15
16473+5753	16 47 23.8	+57 53 58	51.0	17.4	2.9	1.4	22
17081+6422	17 08 06.2	+64 22 53	50.9	19.5	3.8	2.1	15
17086+4045	17 08 40.4	+40 45 01	29.0	10.0	2.5	1.5	17
17133+3651	17 13 18.0	+36 51 51	33.6	8.1	1.3	<1.0 (1)	18
17190+2658	17 19 04.3	+26 58 42	29.0	12.1	2.1	1.2 (1)	26
17329+5359	17 32 55.0	+53 59 31	32.3	16.4	3.3	1.4 (2)	25
17361+5746	17 36 11.7	+57 46 06	63.6	34.6	5.8	2.4	28
19510-5919	19 51 01.4	-59 19 38	415	149	22.5	9.4	14
19575-5930	19 57 33.3	-59 30 53	164	42.1	7.5	2.7	18
20042-4241	20 04 15.7	-42 41 05	214	120	21.2	8.0 (1,2)	28
20075-6005	20 07 33.4	-60 05 12	484	205	40.3	17.6	22
20111-4708	20 11 10.8	-47 08 07	35.0	12.6	2.4	1.4 (2)	15
20120-4433	20 12 00.2	-44 33 48	36.1	21.0	16.9	26.7 (2,3)	16
20135-7152	20 13 35.6	-71 52 53	118	70.9	12.1	4.3 (2)	29
20144-3916	20 14 25.4	-39 16 06	33.1	10.8	1.7	<1.2	16
20165-5051	20 16 33.2	-50 51 41	55.0	22.2	4.3	2.5	16
20248-2825	20 24 51.9	-28 25 41	403	141	25.5	11.5	15
20259-4035	20 25 56.5	-40 35 01	29.1	13.4	3.1	1.4 (2)	24
20296-2151	20 29 38.7	-21 51 40	30.3	15.7	2.4	<1.0 (1,2)	28
20359-3806	20 35 56.8	-38 06 27	71.9	29.2	5.4	2.5	21
20484-7202	20 48 29.3	-72 02 48	166	82.2	10.5	3.8 (2)	29
20526-5431	20 52 41.2	-54 31 00	53.4	25.6	4.0	1.8 (2)	22
20541-6549	20 54 07.9	-65 49 45	157	66.0	11.2	4.2 (2)	29
21044-1637	21 04 28.8	-16 37 23	120	83.9	13.5	5.8	27
21069-3843	21 06 57.0	-38 43 18	163	87.3	12.1	3.8 (2)	29
21100-1435	21 10 01.2	-14 35 55	53.3	20.4	3.0	<1.0 (1)	24
21168-4514	21 16 49.7	-45 14 12	34.6	10.5	4.1	2.8	17
21197-6956	21 19 46.9	-69 56 55	58.4	20.8	9.1	6.0 (3)	22
21206-4054	21 20 38.1	-40 54 59	113	58.0	6.5	2.8 (2)	29
21243-6943	21 24 19.0	-69 43 26	80.1	21.1	3.8	1.5	18
21321+0136	21 32 10.0	+01 36 20	29.4	8.2	1.4	<1.0 (1)	18
21368-3812	21 36 49.5	-38 12 52	51.1	25.8	5.7	3.1	21
21377-0200	21 37 44.7	-02 00 48	54.8	25.0	4.3	2.2	14
21417+0938	21 41 44.1	+09 38 44	72.9	17.9	3.0	<1.2 (1)	18

TABLE I (Continued)

Name	RA (1950)	DEC (1950)	12μm	25μm	60μm	100μm	IRAS Spectral Class
			Flux Densities (Jy)				
21439-0226	21 43 56.8	-02 26 39	558	238	36.2	14.7	--
21453-4708	21 45 19.3	-47 08 45	29.9	11.1	1.7	0.9 (2)	15
21543-1421	21 54 19.6	-14 21 04	70.2	35.9	6.3	2.3	21
22048+1138	22 04 49.0	+11 38 34	162	80.9	12.4	3.5 (4)	--
22142-8454	22 14 14.7	-84 54 59	125	53.4	8.5	3.9	23
22145-8041	22 14 33.3	-80 41 26	107	28.2	6.5	3.3 (1,3)	--
22150-6030	22 15 05.0	-60 30 38	41.8	10.3	1.6	<1.2	18
22190-0751	22 19 04.0	-07 51 41	72.9	33.0	5.3	2.8	25
22196-4612	22 19 40.8	-46 12 07	785	326	58.4	20.7	42
22230-4841	22 23 00.6	-48 41 37	109	42.5	6.7	2.9 (2)	22
22231-4529	22 23 09.4	-45 29 30	104	48.4	6.0	1.9 (2)	29
22267-4400	22 26 46.8	-44 00 20	78.1	19.9	3.5	1.2	18
22280+1250	22 28 00.3	+12 50 53	31.1	10.9	2.1	1.5 (1)	15
22296-6214	22 29 39.0	-62 14 22	42.7	10.8	1.9	<1.0	18
22359-1417	22 35 55.8	-14 17 47	34.7	15.1	2.6	1.1	15
22396-4708	22 39 41.8	-47 08 49	667	170	30.6	10.6	--
22516+0838	22 51 41.1	+08 38 12	103	48.2	8.8	3.5	29
22525-2952	22 52 34.9	-29 52 47	209	81.3	13.8	5.3	22
22540-5740	22 54 03.3	-57 40 03	106	41.4	7.4	4.1	22
22596+1019	22 59 36.7	+10 19 17	112	65.3	9.9	3.3 (4)	--
23041+1016	23 04 08.8	+10 16 25	151	53.7	8.5	3.5	22
23063-3024	23 06 23.5	-30 24 18	93.4	34.6	4.7	2.1	--
23070+0824	23 07 01.6	+08 24 32	57.2	14.4	2.5	1.0 (1)	18
23086+0443	23 08 41.8	+04 43 59	48.0	13.6	2.7	1.6	17
23134-7031	23 13 26.6	-70 31 31	84.9	27.3	4.5	2.0	16
23142-0759	23 14 15.3	-08 00 00	46.3	12.1	2.0	<1.0	--
23142+1019	23 14 17.0	+10 19 38	28.9	8.0	2.0	0.9 (1)	17
23166+1655	23 16 41.7	+16 55 03	749	659	195	66.5	02
23173+2600	23 17 22.7	+26 00 18	183	69.2	9.8	3.1	15
23180+0838	23 18 01.2	+08 38 45	31.7	10.4	1.7	<1.0 (1)	--
23201-1105	23 20 09.1	-11 05 30	41.6	17.4	3.0	1.2	15
23213-4521	23 21 22.2	-45 21 29	125	73.1	13.1	6.0	28
23257+1038	23 25 45.7	+10 38 08	186	112	23.1	6.7 (1)	--
23309+2213	23 30 57.1	+22 13 17	44.6	11.4	2.0	<1.4 (1)	18
23412-1533	23 41 14.1	-15 33 46	1240	395	50.2	14.8	--
23438+0312	23 43 50.4	+03 12 34	115	30.5	10.1	6.4	--
23522-0010	23 52 12.6	-00 10 10	31.8	8.2	1.4	<1.0	18
23551+2451	23 55 11.4	+24 51 43	33.3	8.5	1.4	<0.9	18
23564-5651	23 56 29.4	-56 51 16	69.6	29.3	3.8	2.0	02
23575+2536	23 57 33.2	+25 36 29	45.0	16.6	2.7	1.6	15
23594-0617	23 59 24.4	-06 17 31	59.9	13.3	2.2	<1.0	18

Notes:

(1) Significant contamination of 100μm flux by local cirrus is possible, i.e., c1 > 3 or c2 > 4, see the Supplement.

(2) Probability of variability at 12μm and 25μm > 90%.

(3) Source is extended at 60μm and 100μm. See text for method of flux density determination at these wavelengths.

(4) Source was surveyed with only a single hours-confirmation.

flagged in Table I. The uncertainties on these corrected fluxes are on the order of 20%. No sources showed extended emission at 12 μm or 25 μm.

The last column of Table I gives the classification of the low resolution, 8 μm to 22 μm spectra of these sources, if available. These data were obtained with the *IRAS* spectrometer and were classified by assigning a two-digit number to all spectra. The first digit describes the gross shape of the spectrum, while the second digit provides a quantitative index of a specific feature in the spectrum. Values of the leading digit have the following meaning: "1" denotes a specutrum of a star with spectral type earlier than M5; "2" denotes the spectrum of an oxygen-rich star with an optically thin shell; "3" denotes the spectrum of a star with an optically thick oxygen-rich shell; "4" denotes the spectrum of a carbon-rich star with a shell; "0" denotes an unclassifiable or low signal-to-noise spectrum; "8" denotes the presence of the 11.3 μm emission line.

III. Identifications

Table II includes identifications of the bright 12 μm *IRAS* sources with objects in a number of astronomical catalogs. The term "identification" is used here rather than the term "association" used in the *IRAS* Catalog, since the extra work required to confirm a loose positional association has, in this case, been performed. Most of the identifications were made with objects in the SAO, IRC, or RAFGL catalogs. Most identifications were located within 90″ of the *IRAS* position, although a few RAFGL identifications were located as far away as 3′ and are marked by footnotes. In Table II the first column gives the *IRAS* source name from Table I. The second column gives the corresponding source in the RAFGL. The third column gives the number of the corresponding source in the IRC. The fourth column gives the spectral type from the RAFGL, where available, and in other cases from the SAO, the *General Catalog of Variable Stars* (GCVS, Kukarkin et al. 1965), the *New Catalog of Suspected Variable Stars* (NSV, Kukarkin et al. 1982) the Carbon Star Catalog (Stephenson 1973), or the Catalog of Stellar Identifications (CSI, Ochsebein, Bischoff, and Egret 1979). The fifth column contains the (2.2 μm−12 μm) color indices where the 2.2 μm magnitudes have been taken from the IRC. There exist 2.2 μm magnitudes for several more of the stars in Table II (see, e.g., compilation by Gezari, Schmitz, and Mead 1984) but they are not used here as they do not form a homogeneous set with the IRC magnitudes. The infrared magnitudes used here are defined using a 10,000 K blackbody subtending a solid angle of 1.57×10^{-16} steradians as a zero magnitude reference. Such an object would have flux densities of 28.3, 6.73, 1.19, and 0.43 Jy at 12, 25, 60, and 100 μm, respectively. The last column contains the source name as given in the GCVS, RAFGL, SAO, CSI, NSV, and other comments.

IV. Discussion

The vast majority of bright 12 μm sources have been identified with stars. Based on these identifications, 208 (77%) of the 271 sources are M stars, 24 (9%) are carbon-rich stars including R Coronae Borealis, 16 (6%) are K stars, and 3 (1%) are S stars. Seventeen (7%) have no observed optical spectral type, but lie in the areas of the color-color diagrams, discussed below, inhabited by stars. Eleven of these 17 were associated with cataloged stars. The remaining two objects in the sample are the galaxies M82 and NGC 1068.

Infrared color indices of the sample are shown in Figures 1 and 2. The infrared indices of M 82 and NCC 1068 are significantly different from the indices of the other 269 sources in the sample, being typical of infrared active spiral galaxies (Soifer et al. 1984) and are not included in the figures.

The color indices in Figures 1 and 2 clearly differentiate between the stars with circumstellar dust shells and those without shells. An obvious feature of the figures is the marked clustering of K, early-M, and some late-M stars in the region expected for photospheric temperatures 2000 K–5000 K. A second group of M stars shows a strong infrared excess at 12 μm and 25 μm due to cool (< 200 K–300 K) circumstellar dust shells. The onset of a substantial 12 μm and 25 μm excess occurs rather abruptly at spectral types later than M3–M4. There does not appear to be a continuous distribution in the amount of [12 μm]−[25 μm] excess; rather there is a gap between stars on the photospheric line with a negligible excess and those with excesses greater than 0.3 mag in [12 μm]−[25 μm]. If there is an evolutionary sequence from stars with no shells to stars with shells, then this gap suggests that the observed dust shells form on time scales that are short compared to the time that the shell remains detectable in the infrared. Finally, a population consisting mostly of carbon stars shows an infrared excess from colder (50 K–150 K) material than surrounds many of the M stars (Fig. 1).

The spectral energy distributions of the stars with shells are generally consistent with models for such shells (Rowan-Robinson and Harris 1983). The late-type M stars show excesses associated with the silicate absorption bands at 10 μm and 20 μm. A small number of stars, typically classified as carbon-rich stars, do follow the blackbody line at 2.2, 12, and 25 μm down to temperatures as low as 500 K.

As mentioned above, spectral types have not been previously determined for 17 of the sources in the sample. The 12 μm–25μm–60μm colors of 13 of these sources are consistent with M stars with circumstellar dust shells. The colors of the five remaining sources place them in the region of overlap between M stars with circumstellar dust

TABLE II

Catalog Comparison Data

Name	Identification RAFGL	IRC	Spectral Type Assoc.	[2.2]-[12] (mag)	Notes
00050-2546	17	-30002	M6E	3.1	SY Scl
00121-1912	38	-20006	M1 III	0.2	7 Cet
00128-3219	40	-30006	M6E	1.6	S Scl
00192-2020	53	-20007	M5-6SE	0.9	T Cet
00193-4033	5017				(1)
00238-4234	64		K0		α Phe
00245- 652	66	-10009	M7	1.6	UY Cet
00254+1736	71	+20007	M4 IIIB	0.3	47 Psc
00254-3317	70		M3		η Scl
00254-1156	4032s	-10010	M4	0.2	AG Cet
00410-1815	106	-20010	K1 III	0.2	β Cet
00439+1512	108	+20012	M4 IIIA	0.2	57 Psc
00445+3224	109	+30015	S6,2E	2.1	RW And
00515-6308			MB		HD 5276
01030-3157	156	-30013	M9	1.8	AD Scl
01037+1219	157	+10011	M10	5.7	WX Psc
01085+3022	168	+30021	M9	4.8	NSV 426
01217+2341	5048	+20023	M7	1.5	DO 8748 (8)
01246-3248	215	-30015	C6,4	1.8	R Scl
01251+1626	216	+20025	M6	1.8	ST Psc
01261-4334	218		K5		γ Phe
01438+1850	5052	+20029	M6	1.8	SV Psc
01452-8026			MB		VZ Hyi
01516-4632	261		M4 III		ψ Phe
01527+1656	4013	+20032	M6	2.0	DO 8984 (8)
01576-2119	286	-20024	M1 G	0.3	o Cet
01579-0845	287	-10030	M3 III	0.2	AR Cet
02000+0726	292	+10025	M7	1.4	DO 358 (8)
02036-1027	297	-10032	M2	1.3	UZ Cet
02043+2313	5063	+20038	K2 IIIAB	0.1	α Ari
02152+2822					(2)
02168-0312	318	00030	M5.5E		o Cet
02234-0024	4195s	00032	M4.5E	3.0	R Cet
02270-6944			M6-7		HD 15701
02270-2619	337	-30021	C4,3E	3.4	R For
02351-2711	357	-30023	M9	3.9	NSV 878
02401-0013	4220s		GALAXY		NGC1068 (3)
02427-5430			MC		W Hor
02455-1240	378	-10040	M4 III	1.0	Z Eri
02455+1718	379	+20049	M6E	1.4	T Ari
02464-5915			M		X Hor
02497-0828	392	-10041	M5 III	0.9	RR Eri
02522-5005			M7E G		R Hor
02529+1807		+20051	M6 III	0.3	45 Ari
02547+1106	5087				

TABLE II (Continued)

Name	Identification RAFGl	IRC	Spectral Type Assoc.	[2.2]-[12] (mag)	Notes
02587+2136	414	+20052	M8	1.4	UZ Ari
02596+0353	419	00038	M1.5 III		α Cet
03082+1436	455	+10040	M5.5E	2.3	U Ari
03112-5730			C6,2.5		TW Hor (4)
03172-2156	475	-20041	M3 G	0.2	τ^4 Eri
03287-1535					(2)
03318-1619	500	-20043	M7E	1.8	RT Eri
03336-7636			ME		X Men
03364-5533			M6-7 III		HD 22868
03463-0710	525	-10052	M5	0.9	BR Eri
03479-7423			M0		γ Hyi
03482-5213			M5-6 III		HD 24306
03489-0131		00050	M4 III	1:6	SU Eri
03505-0919					(2,5)
03507+1115		+10050	M8E	4.2	NML Tau
03511-4558			ME		U Hor
03557-1339	537	-10055	M1 III	0.1	γ Eri
04001-6217			MB		γ Ret
04020-1551	542	-20049	M6 II	1.9	V Eri
04094-2515	552	-30033	M7E	3.0	W Eri
04140-8158	4046		ME		U Men
04157-1837	563	-20052	M7	1.7	RS Eri
04311-0004		00062	M9	2.1	BD Eri
04330-6307			M4E		R Ret
04345-2740	605	-30038	M7	1.4	UU Eri
04361-6210			M7		R Dor
04382-1417	615	-10075	M7	1.8	BX Eri
04382-1946	614	-20059	M4 G	0.2	DM Eri
04387-3819	617		M6E		R Cae
04404-7427					SY Men
04573-1452	667	-10080	C7,4E	2.6	R Lep
05027-2158	682	-20066	M7E	2.1	T Lep
05033-2226	688	-20067	K5 III	0.2	ε Lep
05069-3434	699		MC		HD 33452
05071-6327			M3 III		HD 33684
05096-4834			ME		S Pic
05098-6422			M7		U Dor
05217-3943			M0		SW Col
05418-4628			N		W Pic
08063+6522	1232	+70082	M5-6 G	1.3	RZ UMa
08525+1725	1298	+20206	C5,4	1.2	X Cnc
08538+2002	1301	+20207	C5,5	1.8	T Cnc
08555+1102	1302	+10199	M4 III	1.0	RT Cnc
09057+1325	1321	+10203	M6	1.3	CW Cnc
09069+2527	1323	+30208	M7E III	2.3	W Cnc

TABLE II (Continued)

Name	Identification RAFGl	IRC	Spectral Type Assoc.	[2.2]-[12] (mag)	Notes
09076+3110	1326	+30209	M6 IIIAS	1.2	RS Cnc
09180+3436	1341	+30210	K IIIAB	0.1	α Lyn
09180+5654	1344	+60193	M4 IIIA	0.4	CG UMa
09425+3444	1376	+30215	M7E	2.1	R Lmi
09430+5721	1378	+60197	M3 IIIAB	0.4	CS UMa
09448+1139	1380	+10215	M7E		R Leo
09452+1330	1381	+10216	C6	9.2	CW Leo
09517+6954	1388		GALAXY		M 82 (3)
10131+3049	1403	+30219	CE	6.1	RW LMi
10172+2005	1410	+20219	K0 III	0.1	γ^1 Leo
10193+4145	1411	+40218	M0 III	0.2	μm UMa
10305+7001	1423	+70095	M6	1.5	CT UMa
10350-1307	1427	-10242	C6,4	1.2	U Hya
10353-1145	1428	-10243	M6	1.5	FF Hya
10411+6902	1432	+70099	M5E	2.9	R UMa
10416+6740	1433	+70100	C6,3	0.9	VY UMa
10491-2059	1439	-20218	C6,5	3.4	V Hya
10521+7208	1443	+70102	M8E III	2.8	VX UMa
10580-1803	1450	-20222	M7	2.0	R Crt
11006+6201	1454	+60208	K0 IIIA	0.1	α UMa
11125+7524	1474	+80023	M5	1.8	CS Dra
11251+4527	1489	+50211	M4 III	0.9	ST UMa
11252+1525	1488	+20229	M5	1.9	AF Leo
11284+6936	1494	+70107	M0 III	0.1	λ Dra
11308-1020					(2)
11358+0824	1502	+10243	M4 III	0.2	ω Vir
11432+0648	1509	+10245	M1 IIIAB	0.1	ν Vir
11445+4344	1511	+40228	M6 III	1.8	AZ UMa
11462-2628	1512	-30182	M4 G	0.2	II Hya
11473-2718	1515	-30183	M5	1.3	HD 102766
11485-1055	1516	-10258	M3	1.1	RU Crt
11501-0719	4830s	-10259	M6-7E	1.2	S Crt
11538+5808	1519	+60213	M6E	1.6	Z UMa
12020+0254		00214	MA	2.6	TZ Vir
12046-0629	1535	-10263	M5 III	1.2	RW Vir
12075-2220	1536	-20233	K2 III	0.2	ε CRv
12226+0102	1549	00217	C5,3E	1.7	SS Vir
12277+0441	1554	00220	M7 III	1.3	BK Vir
12344+2720	1564	+30241	M5	1.8	DO 14615 (8)
12345-1715	1565	-20242	M6	2.3	T Crv
12380+5607	1570	+60220	M7 II	1.4	Y UMa
12427+4542	1576	+50219	C5,5	1.3	Y CVn
12447+0425	1579	00224	C8,1E	4.3	RU Vir
12517-0915	1583	-10274	M3 III	0.3	ψ Vir
12526+4728	1585	+50222	M5 III	0.3	TU CVn
12530+0340	1586	00226	M3 III	0.3	δ Vir

TABLE II (Continued)

Name	Identification RAFGl	IRC	Spectral Type Assoc.	[2.2]-[12] (mag)	Notes
12544+6615	1588	+70116	C4,5	1.4	RY Dra
12562+2324	5278		M2		T Com (1)
13001+0527	1594	+10262	M8 III	1.9	RT Vir
13039+2253	5282	+20254	M5 IIIA	0.3	40 Com
13114-0232	1606	00230	M7 III		SW Vir
13172+4547	1615	+50226	M6 IIIA	2.6	V CVn
13269-2301	1627	-20254	M6.5E		R Hya
13303-0656	1633	-10290	M6.5E	2.1	S Vir
13462-2807	1650	-30207	M8E		W Hya
13468+3947	1652	+40248	M6.5E	1.9	R CVn
13492-0325	1653	00237	M6	1.2	AY Vir
13495+3441	1654	+30251	M3 III	0.3	AW CVn
13499+6458	1656	+60226	M3 IIIAS	0.2	10 Dra
13582+3806	4924s	+40252	M8	1.5	DO 14839 (8)
14059+4405	1680	+40253	M4 III	0.3	BY Boo
14086-0730	1686		M9 III		
14086-2839	1685	-30215	M6.5E	2.5	RU Hya
14133+1925	1693	+20270	K2 IIIP		α Boo
14142-1612	1694	-20266	M6 III	1.4	EW Vir
14162+6701	1696	+70124	M6E	1.5	U UMi
14219+2555	1706	+30257	M8E III		RX Boo
14247+0454	1710	00243	M6E III	2.8	RS Vir
14277+3904	4947s	+40257	M6E	1.1	V Boo
14371+3245	1719	+30261	M5E	1.3	RV Boo
14390+3147	1720	+30262	M5 G	1.0	RW Boo
14412+2644	1724	+30263	M3 IIIA	0.2	34 Boo
14427+2717	4201	+30264	K1 III	0.1	ε Boo
14437+1520	1728	+20275	M5 IIAB	0.4	DO 15069 (8)
14508+7421	1740	+70125	K4 III	0.2	β UMi
14550-1214		-10308	M5 G	1.3	FY Lib
14567+6607	1744	+70126	M5 III		RR UMi
15060+0947					(2)
15193+1429	1765	+10290	M5E III	1.8	S Ser
15193+3132	4990s	+30272	M6.5E	1.8	S CrB
15223-0203	1769	00265	M7	1.4	DO 3724 (8)
15255+1944	1773	+20281	M8.5E III	4.2	WX Ser
15262+0400		00266	M9	3.8	NSV 7098
15298+0348	1777	00268	M8E III	2.0	WW Ser
15314+7847	1780	+80030	M7E III	1.8	S UMi
15341+1515	1788	+20282	M5 IIB	0.8	τ^4 Ser
15361+2441	1790	+20283	M5 G	0.5	DO 15290 (8)
15410-0133	1793	00269	M6E III	1.7	BG Ser
15418+0634	1794	+10294	K2 IIIP	0.1	αSer
15464+1817	1799	+20284	M1 IIIAB	0.2	K Ser
15465+2818	4219		F8 IAP		R CrB (6)

TABLE II (Continued)

Name	Identification RAFGl	IRC	Spectral Type Assoc.	[2.2]-[12] (mag)	Notes
15477+3943		+40273	C6,3	3.1	V CrB
15483+1517	1801	+20285	M6.5E	1.8	R Ser
15492+4837	5313	+50246	M6 IIIAS	1.2	ST Her
15566+3609	5315	+40276	M7	2.3	RS CrB
16011+4722	5317	+50248	M6 G	1.5	X Her
16081+2511	1832	+30283	M7E III	2.2	RU Her
16095+2337	1834	+20294	M4 III	0.3	10 Her
16117-0334	1837	00280	M0.5 III		δ Oph
16164+5952	1841	+60241	M4 IIIA	0.3	AT Dra
16235+1900	1858	+20298	M7E	2.6	U Her
16260+3454	1862	+30292	M9	3.9	V697 Her
16269+4159	1864	+40283	M6 III		30 Her
16306+7223	1868	+70135	M7E III	1.4	R UMi
16418+5459	1886	+50255	M6 G	1.6	S Dra
16432+1213	1889	+10310	M6E	1.8	UV Her
16473+5753	1898	+60248	M7	1.2	AH Dra
17081+6422		+60249	MS	1.2	TV Dra
17086+4045		+40292	M7	0.7	DO 15828 (8)
17133+3651	1950	+40295	K3 II	0.2	π Her
17190+2658					V393 Her
17329+5359	1987	+50267	M7E III	2.6	SY Dra
17361+5746	1993	+60251	M8 III	1.8	TY Dra
19510-5919			M7E		S Pav
19575-5930			MB		ν Pav
20042-4241	5578				V2334 Sgr
20075-6005			MC		X Pav
20111-4708			ME		R Tel
20120-4433	7111s		S4,4P		RZ Sgr (1)
20135-7152					NSV 12961
20144-3916			MD		TT Sgr
20165-5051	5585		MC		Y Tel
20248-2825	5587	-30430	M6E		T Mic
20259-4035	5588		M6E		U Mic (1)
20296-2151	7118s	-20590	M9	2.9	RU Cap
20359-3806	5589				NSV 13190
20484-7202					(2)
20526-5431			ME		S Ind
20541-6549					(2)
21044-1637	2708	-20596	M6 III	1.7	RS Cap
21069-3843	5592				
21100-1435	2722	-10558	M5	1.1	RX Aqr
21168-4514	5593		N0		T Ind
21197-6956			C7,3		Y Pav
21206-4054	5594		M6E		V Mic
21243-6943			MB		SX Pav

TABLE II (Continued)

Name	Identification RAFGl	IRC	Spectral Type Assoc.	[2.2]-[12] (mag)	Notes
21321+0136	2782	00504	M6	0.4	DO 7488 (8)
21368-3812	5595				ISS 118
21377-0200	2787	00507	M5	1.5	DO 7540 (8)
21417+0938	2800	+10503	K2 IB	0.1	ε Peg
21439-0226	2806	00509	M7 III	1.7	EP Aqr
21453-4708			ME		R Gru
21543-1421	2819	-10573	M4	1.6	SVS 5490
22048+1138	2851	+10510	M7	3.8	SVS 102147
22142-8454			M7 III		HD 210548
22145-8041	4288		M6 III		ε Oct
22150-6030			K3 III		α Tuc
22190-0751	2889	-10580	MB	1.4	DZ Aqr
22196-4612	4289		S4,7		π^1 Gru
22230-4841	4687s		M8E III		S Gru (1)
22231-4529	5603				(1)
22267-4400	5604		M4		δ^2 Gru
22280+1250	5694s	+10519	M6EP	1.3	GM Peg
22296-6214			MB		ν Tuc
22359-1417	5702s	-10584	M7	1.2	AB Aqr
22396-4708	4292		M3 II		β Gru
22516+0838	2984	+10523	M9 III	2.9	DO 7912 (8)
22525-2952	2989	-30456	MB	1.5	V Psa
22540-5740	4293		M8 III		HD 216824
22596+1019	4295	+10525	M9.5	4.3	
23041+1016	3023	+10527	M7E III	2.1	R Peg
23063-3024	3029	-30465	M4	1.7	Y Scl
23070+0824	3031	+10529	M4S	0.3	GZ Peg
23086+0443	3039	+00527	M5 G	0.4	DO 7959 (8)
23134-7031			MC		HD 219831
23142-0759	3058	-10597	M3 III	0.3	χ Aqr
23142+1019	3059	+10531	M7	0.4	EO Peg
23166+1655	3068		C		
23173+2600	3075	+30509	M7E III	1.7	W Peg
23180+0838	3076	+10533	M6.5E III	1.7	S Peg
23201-1105	3083	-10598	M8	1.5	SV Aqr
23213-4521	4296				SVS 5712
23257+1038	3099		C		
23309+2213	3113	+20550	M5 IIIA	0.2	71 Peg
23412-1533	3136	-20642	M7E PEC	2.9	R Aqr (7)
23438+0312	3147	+00532	C7,2	0.8	19 Psc
23522-0010	3174	-00535	M5 IIB	0.3	XZ Psc
23551+2451	3186	+20557	M3 III	0.0	ψ Peg
23564-5651			M3E		S Phe
23575+2536	3194	+30522	M7E III	1.8	Z Peg
23594-0617	3197	-10608	M3 III	0.5	30 Psc

TABLE II (Continued)

Notes:

1) Positions discrepant with RAFGL, but identifications likely.
2) Not previously cataloged.
3) Extended source. Point source flux densities quoted may be misleading.
4) Confused with a galaxy at 100 μm.
5) SW Eri is nearby.
6) Hydrogen deficient, carbon rich star.
7) Mira star with hot sub dwarf companion and radio jet (Kafatos, Hollis, and Michalitsianos, 1983).
8) Dearborn Observatory Catalog of red stars.

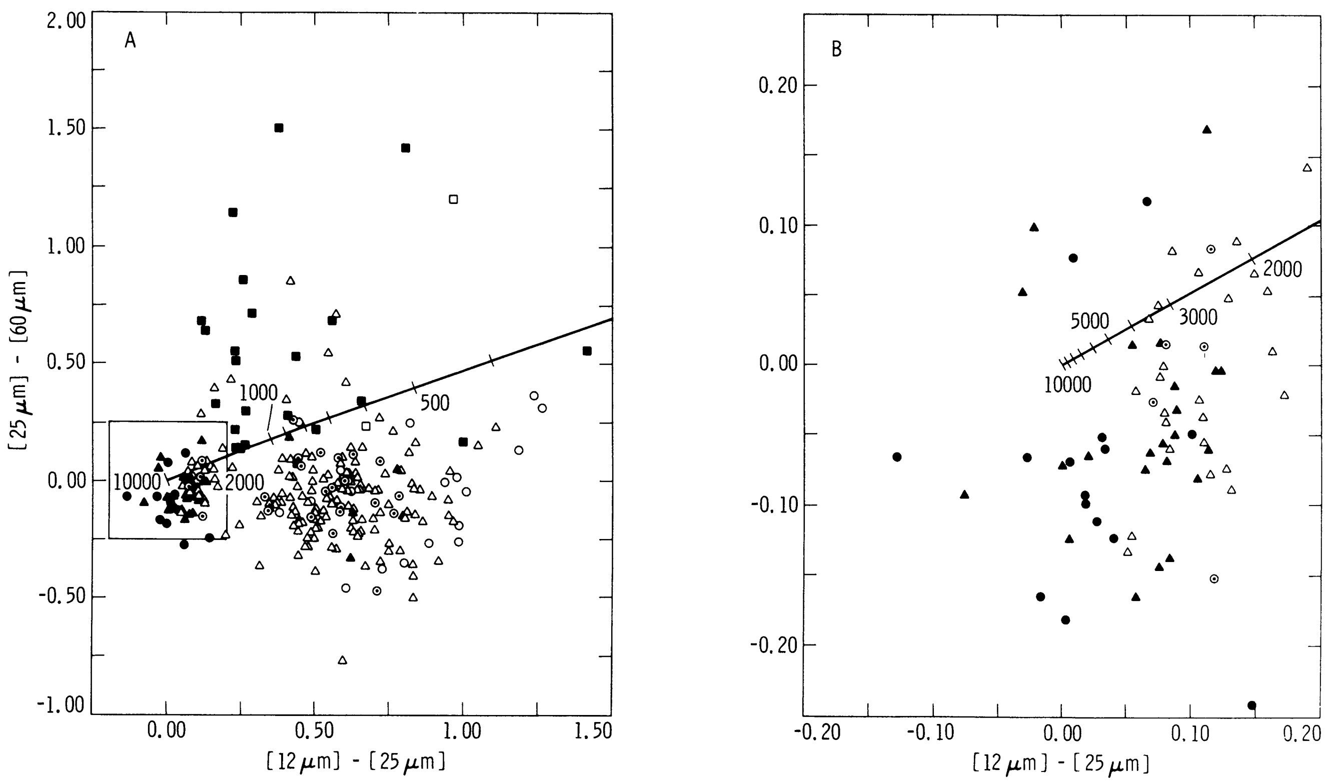

FIG. 1–The *IRAS* 12 μm–25 μm–60μm color indices are shown for all stars in the sample. The magnitude scale is defined in the text. Figure 1B is an enlargement of the box shown in Figure 1. K stars are represented as filled circles. M0–M3 stars are represented as filled triangles, M4–M10 stars are represented as open triangles, M stars with no subtype are represented as dots within a circle, S stars are represented as open squares, carbon stars (including R CrB) are represented as filled squares, and stars with no previously cataloged spectral types are represented as open circles. See text for sources of spectral types.

shells and carbon stars in Figure 1.

The spectra of all of the 17 sources without previously cataloged spectral types were measured with the *IRAS* spectometer. Of these, 15 have silicate emission features and *IRAS* colors consistent with their being M stars with circumstellar dust shells, while two show the emission feature at 11 μm characteristic of carbon stars.

Stars with no spectral features and stars with optically thin oxygen-rich dust shells (classes 1n and 2n, respectively) each comprise about 40% of those whose spectra were measured. In general, the strength of the silicate emission features correlates with the [12 μm]−[25 μm] excess. That is, the sources with the strongest silicate emission features tend to be the late-M stars toward the right side in Figures 1 and 2. The *IRAS* spectral classifications also agree well with the optical spectral types. Only

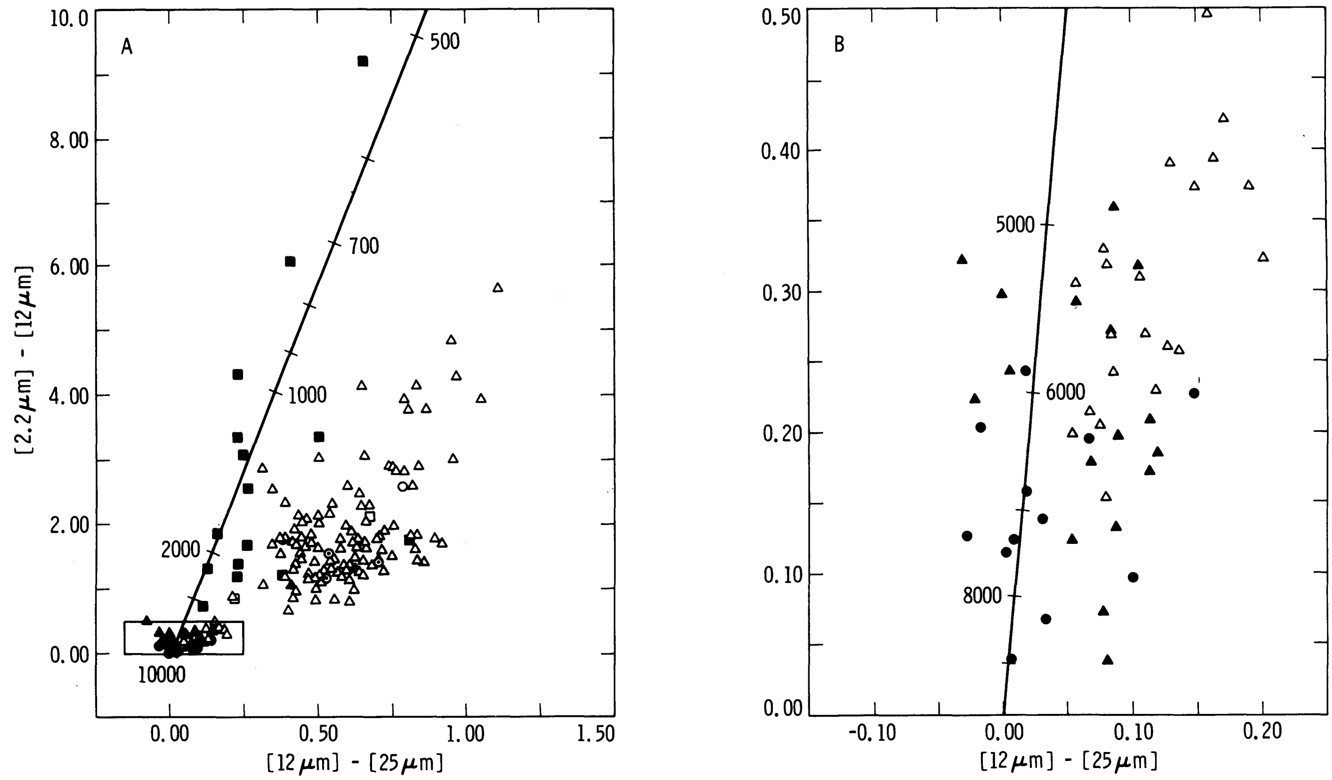

FIG. 2–The 2.2 μm-12 μm-25 μm color indices are shown for all sources in the sample that have counterparts in the *Two Micron Sky Survey Catalog* (Neugebauer and Leighton 1969). The 2.2 μm magnitudes were taken from the *Two Micron Sky Survey Catalog* and the 12 μm and 25 μm magnitudes are taken from the *IRAS* data (see Table II). Symbol notation is the same as in Figure 1.

five stars gave possibly conflicting classifications. A visual examination of the *IRAS* spectra of 08555+1102 (RT Canari M4 III), 15492+4837 (St Herculis, M6 III*a*s), and 22196−4612 (π Gruis, S4,7) indicated that weak silicate features are present in the infrared spectra rather then weak silicon carbide emission as suggested by the *IRAS* classification. The infrared spectrum of 21197-6956 (γ Pavonis, C7,3) is featureless, showing no sign of the silicon carbide or silicate features.

The remaining discrepant case 1349+3441 (AW Canum Venaticorum, M3 III) is quite interesting because the 11.3 μm feature is clearly present in its infrared spectrum. One successful model for the 11.3 μm feature (Leger and Puget 1984) suggests that it is caused by emission from small grains formed primarily of carbon. Such grains are not likely, however, to be formed in the oxygen-rich environment implied by the classification of this star. If this feature is like that seen in other environments such as planetary nebulae, and is associated with AW CVn, then either the spectral classification of this star is incorrect, or the model of small carbon grains as the carriers of the unidentified infrared features may have to be modified.

Given that the sample is composed of late-type stars, one expects some of the sources to be variable. Thirty-four sources are listed in the *IRAS* Point Source Catalog with a probability greater than 90% of being variable at 12 μm and 25 μm. (*Supplement*). These sources are flagged in Table I. Most of the variables have 12 μm–25 μm–60μm colors consistent with a star with a circumstellar dust shell; those with a known spectral type are late-M or carbon stars. Typically, these sources varied by a factor of 1.5–2.0 over a period of about six months at 12 μm with the amplitude diminishing with increasing wavelength.

V. Summary

Almost all sources brighter than 0 magnitude at 12 μm with absolute galactic latitude greater than 30° have infrared colors typical of late-type stars and may be identified as such in star catalogs or by their infrared colors and spectra. Twelve sources exhibited extended emission at 60 μm and 100 μm, one source (AW CVn) has the 11.3 μm feature present in its spectrum, and 34 sources are probably variable in the far infrared. K and M stars without circumstellar dust shells, M stars with circumstellar dust shells, and carbon stars occupy well-defined regions of infrared color-color diagrams and have distinctive 8 μm to 22 μm spectra. These data will be useful in classifying unidentified *IRAS* sources.

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